

# SkyAzúl

## EQUIPMENT SOLUTIONS

TRS05



INSTALLATION, CALIBRATION and SERVICE MANUAL



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## 1 GENERAL INFORMATION

The PAT TRS 05 system interface has been designed to use radio communication for load sensors. The TRS 05 receives a radio signal from a transmitter sensor and converts a signal as a replacement for the existing hardwired sensor.

Review system operator's manual for system description and operation. All system functions and error codes will remain the same for the DS350 system.

This manual will describe the operation, sensors setup and calibration, and additional troubleshooting points for the TRS 05.

## 2 WARNINGS

Review system operator's manual for system warnings.

The responsibility for the safe operation of the crane remains with the crane operator who must ensure that all warnings and instructions supplied are fully understood and observed.

Prior to operating the crane, the operator must carefully and thoroughly read and understand the information in this manual and the system manual to ensure that the operation and limitations of the system and the crane are known.



### **WARNING**

**The system can only work correctly, if all sensors/transmitters have been properly set. For correct setup, the operator has correctly complete all procedures in this manual, the system manual, and the setup procedure in accordance with the real rigging state of the crane. To prevent material damage and serious or even fatal accidents, the correct adjustment of the system has to be ensured before starting the crane operation.**

**Always refer to operational instructions and load charts provided by the crane manufacturer for specific crane operation and load limits.**

### 3 FEATURES

The PAT TRS 05 has the following features:

- Can be hardwired to most PAT systems, and certain crane systems.
- Wireless operation of 4 sensors.
- Minimum of 500 feet LOS.
- Easily and clearly shows the operator required information for the radio sensor.
  - Power LED (red)
  - Link condition LED (green), LED on sensor installed and linked, LED flashing installed but link or communication has been lost, and LED off sensor not installed.
  - Low battery indication LED (yellow)
  - Warning of Error LED (red)

### 4 SYSTEM DESCRIPTION

#### 4.1 RECEIVER MODULE

The receiver module has the following functions:

- Visual indication of receiver power, radio links (sensor on line), sensors low battery, and alarm conditions.
- Installs/uninstalls a sensor
- Allows a zero point and output adjustment of a load sensor.

Red Power LED  
 Red Alarm LED  
 Sensor On Line  
 Green LED 1  
 Green LED 2  
 Green LED 3  
 Green LED 4  
 Sensor Low Battery  
 Yellow LED 1  
 Yellow LED 2  
 Yellow LED 3  
 Yellow LED 4



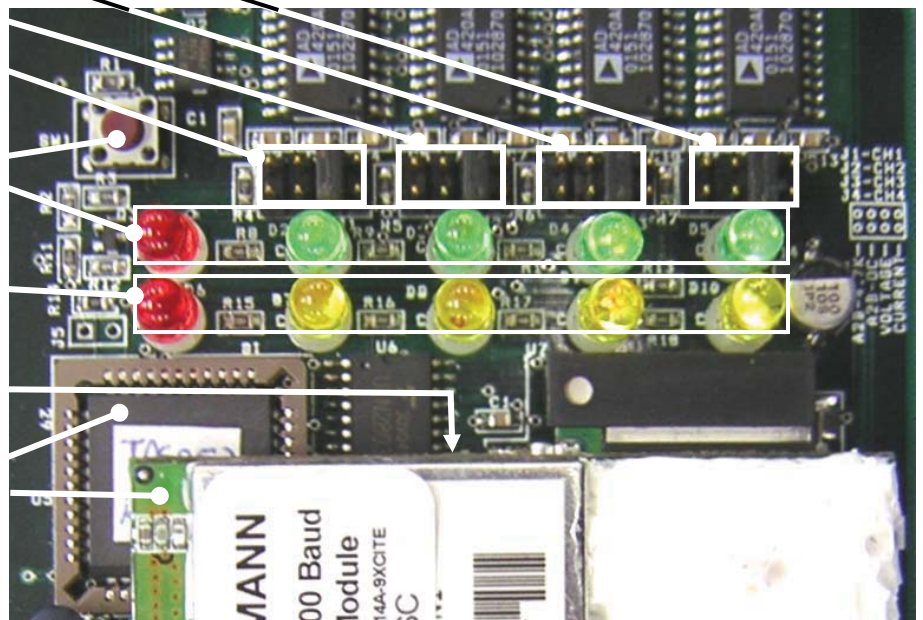


## 4.1.1 LEDs

Red Power LED	Power is applied to the circuit board.
Red alarm LED	An installed sensor is indicating an alarm, or communication as been lost to an installed sensor.
Green LED 1 ON	Sensor on channel #1 is installed and communicating correctly.
Green LED 1 FLASHING	Sensor #1 is not communicating correctly.
Green LED 1 OFF	No sensor is installed on channel #1.
Yellow LED 1 ON	Sensor #1 batteries are low and need replaced. Note that the sensor is still operating correctly.
Green LED 2 ON	Sensor #2 is installed and communicating correctly.
Green LED 2 FLASHING	Sensor #2 is not communicating correctly.
Green LED 2 OFF	No sensor is installed on channel #2.
Yellow LED 2 ON	Sensor #2 batteries are low and need replaced. Note that the sensor is still operating correctly.
Green LED 3 ON	Sensor #3 is installed and communicating correctly.
Green LED 3 FLASHING	Sensor #3 is not communicating correctly.
Green LED 3 OFF	No sensor is installed on channel #3.
Yellow LED 3 ON	Sensor #3 batteries are low and need replaced. Note that the sensor is still operating correctly.
Green LED 4 ON	Sensor #4 is installed and communicating correctly.
Green LED 4 FLASHING	Sensor #4 is not communicating correctly.
Green LED 4 OFF	No sensor is installed on channel #4.
Yellow LED 4 ON	Sensor #4 batteries are low and need replaced. Note that the sensor is still operating correctly.
Green Heartbeat LED	This will flash during normal operation. If it is a solid or off, the receiver has a software error or the board has a component failure.

## 4.1.2 Control Identification

- Sensor/Channel #1 output jumper J4
- Sensor/Channel #2 output jumper J3
- Sensor #3/Channel #2 output jumper J2
- Sensor #4/Channel #2 output jumper J1
- ID button  
power (red), sensor on-line 1-4 left to right (green)
- LEDs  
1-4 left to right (yellow)
- LEDs Green Heartbeat LED (located just under radio module)  
software chip  
radio module 031-300-300-024



Heartbeat LED: When blinking, this small surface board mounted green LED indicates the system is operation properly.

ID button: The red ID button, located below the software chip on the receiver board, is used to setup the sensor transmitter to the receiver.

## 5 OPERATION

### 5.1 RECEIVER

Upon switching on crane ignition switch, the system starts with an automatic test of the receiver board, LEDs and electronic components. The red power LED should be on and the green LEDs that sensors have been linked to should also be on.

If an alarm condition exists investigate and clear the condition before operation and using the system. During the normal operation of the system, the POWER and SENSOR ON LINE (if linked to a sensor) LEDs should be on.

#### **POWER LED**

The POWER LED shows that the receiver is getting power from the crane. The receiver is on any time the crane is operating and supplying power to the system.

#### **SENSOR ON LINE LED**

The SENSOR ON LINE LED indicates the status of communication of the transmitter(s). During normal operation of the system, the LED will be on. The LED will flash if communication or transmission between the sensor transmitter and the receiver is interrupted or lost. The system should not be operated if the SENSOR ON LINE LED is flashing. If the LED is off no sensor is linked to this channel.

#### **LOW BATTERY LED**

The low battery indicator will light indicating that you have a limited time to operate before the sensor battery life ends. When the battery level is to the point that it is too low to operate, the system will stop functioning. Use any off-the-shelf alkaline C-cells; Duracell, Eveready, etc.

#### **ALARM LED**

This LED will light simultaneously with the engaging of the lock out solenoids (if installed).

#### **Test the electronics**

Cycle the power to the system, each LED on the receiver will light for 2 seconds when the system is powered. All of the indicator lights must come on or the system is not functioning properly. If any light does not function, do not use the system until it has been repaired.

Refer to receiver operating manual for pre-operational inspection.

If a green sensor on line LED starts to flash, this means a sensor is installed and the communication link has been lost. When communication has been lost to a load cell, the receiver will output the maximum voltage signal for the output sensor (9VDC).

If a low battery LED is on, replace the batteries in the linked transmitter, refer to [Battery Replacement](#).

The TRS 05 setup/calibration procedure allows the operator to input the type of sensors being used, and adjust the zero point and output adjustment of a load sensor. The operator must complete the setup procedure for each sensor.

## 5.2 TRANSMITTER

The transmitter has an LED that will flash when a signal is transmitted to the receiver. Our system transmits an OK signal every one transmit per 4 sections via a frequency hopping spread spectrum transmission method. This is to ensure accurate and consistent reception of data and to reduce the possibility of unnoticed failure. The separate channels greatly reduce the probability of failure due to external interferences. The receiver cycles through the three missed data packets, when software logic and/or lost signal, system will indicate a communication error.

### 5.2.1 Load Cell

The load cell transmits once every 1 to 2 seconds when in standby, and 2 times a second when the load changes. It will continue at 2 times a second for less than a 1 minute before dropping back to one transmission every 1 to 2 seconds. There is no time it goes to sleep.

Note: To extend battery life, remove batteries from transmitter(s) if load cell(s) will not be used for extended periods of time. Reinstalling batteries into the transmitter will not require a set up.

### 5.2.2 A2B

The PAT radio Anti-two Block (A2B) system works to prevent a two block condition using a weight and switch. During normal operation the weight closes the A2B switch. The transmitter has an LED that flashes approximately every 2 seconds when the switch is transmitting. If the weight is lifted and the switch opens, the transmitter immediately (<100milliseconds) sends a two-block signal condition to the receiver to be displayed on the console and lockout the crane movements (if connected to solenoid). The LED will flash rapidly during a two-block condition and will stop flashing after 15 seconds when the switch goes into sleep mode. While in sleep mode, the receiver will stay in a two-block or communication loss condition. Sleep mode increases battery life by reducing the number of radio transmissions. To wake the switch, simply close the switch by lowering the weight.

### 5.2.3 Wind Speed Sensor

The sensor is delivered with a bracket support that allows the sensor to stay perpendicular to the ground through the boom angle range.



## WARNING

**CONTACT CRANE MANUFACTURER FOR WELDING INSTRUCTIONS PRIOR TO WELDING ON BOOM.**

The mounting pole is affixed to the boom tip at your discretion so that the anemometer sensor is mounted approximately a foot higher than the boom sheaves and will not interfere or be damaged by hoist lines or extension mounting or movement. Affix the mounting pole to the boom tip or possibly the length cable anchor pin so the pipe supports the sensor. It must be installed so that no part of the crane can disrupt the measurement of wind.

### 5.2.4 Angle

The angle sensor total range is approximately 105° and the zero point is adjustable in the software in the angle calibration menu. With no software adjustment, the angle range will allow a -15° to 90° range, but if the angle sensor is zeroed at -5° (-5° becomes 0°) your angle range will be -10° to 95°. Therefore, when affixing the mounting plate to the boom, make sure you will be able to get your desired angle range for your application.

## 5.3 REPEATER

The purpose of the repeater is to reduce the possibility of a communication loss error by receiving the load cell transmitted ID code and re-transmitting the same ID code out to the TRS 05. To do this, the repeater is positioned at the boom tip, up the hoist rope from the load cell and up the boom from the TRS 05. If the load cell does not have a direct line of sight or blocked by a wall/structure from the TRS 05 then there is less chance of the signal absorption/interference.

The repeater is setup from the factory to repeat signals from the load cells to the TRS 05 receiver. TRS 05 can receive both transmissions (load cell and repeater) and output the load signal to the system computer.

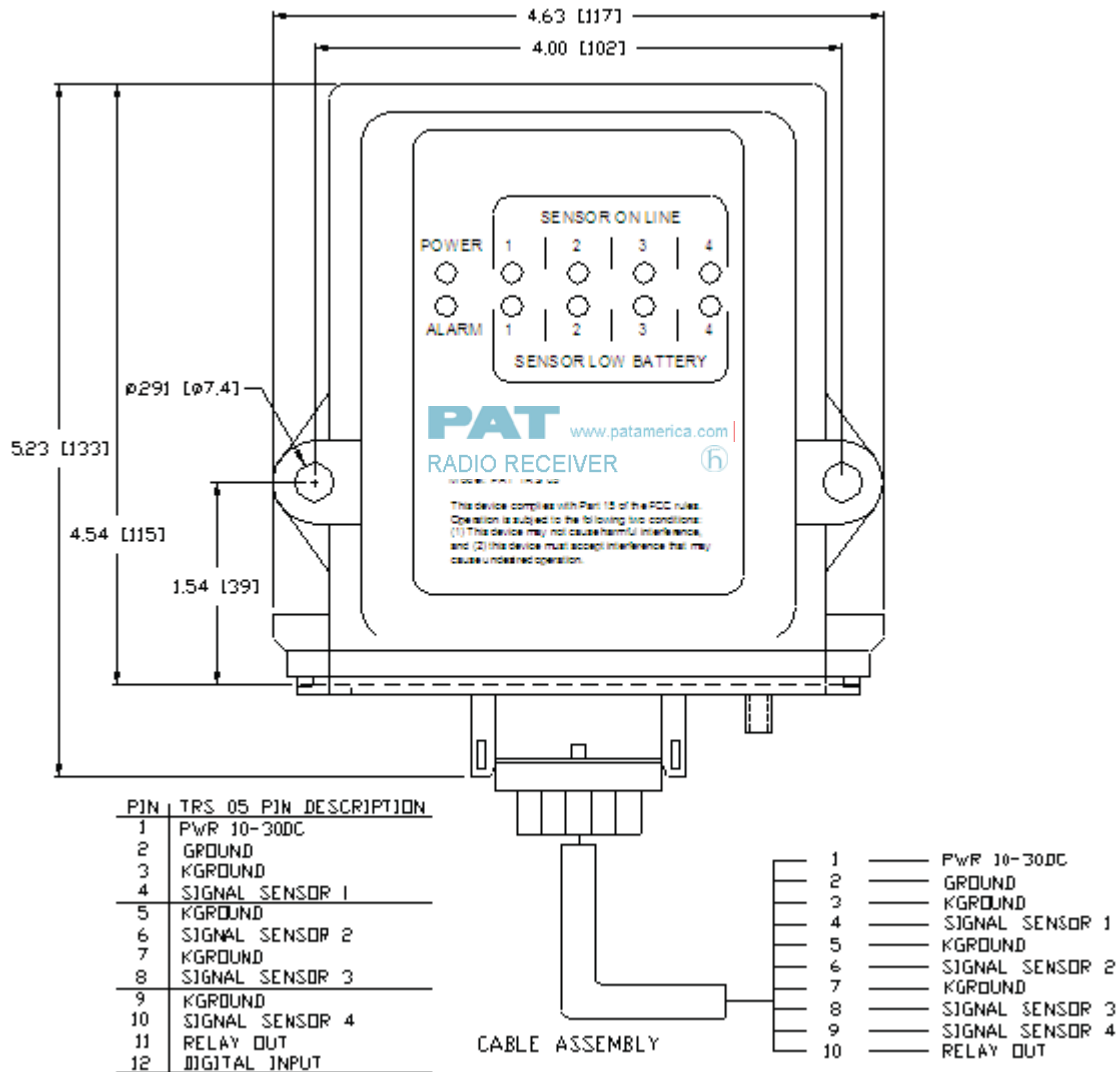
After switching power on to the repeater from the crane ignition switch, the system starts with an automatic test of the repeater board, LEDs, and electronic components. The red power LED should be on and other red LED blinks when the repeater is transmitting a signal.

## 6 COMPONENT INSTALLATION

### 6.1 RECEIVER

The TRS 05 receiver module should be mounted so the operator can view the LED's.

Securely attach the receiver onto a solid surface using the mounting holes.



Power cable connections are show above.

### 6.2 REPEATER

The repeater module is mounted on the boom tip in line of sight to the receiver and the load cell. The main purpose of the repeater is to receive and transmit the load cell ID code of the load cell during operation. If the load cell line of sight is obstructed by a barrier (i.e. wall or building), the repeater should prevent and signal loss.

Power cable connections: PIN 1 - +UB (9 to 30VDC), PIN 2 - GND

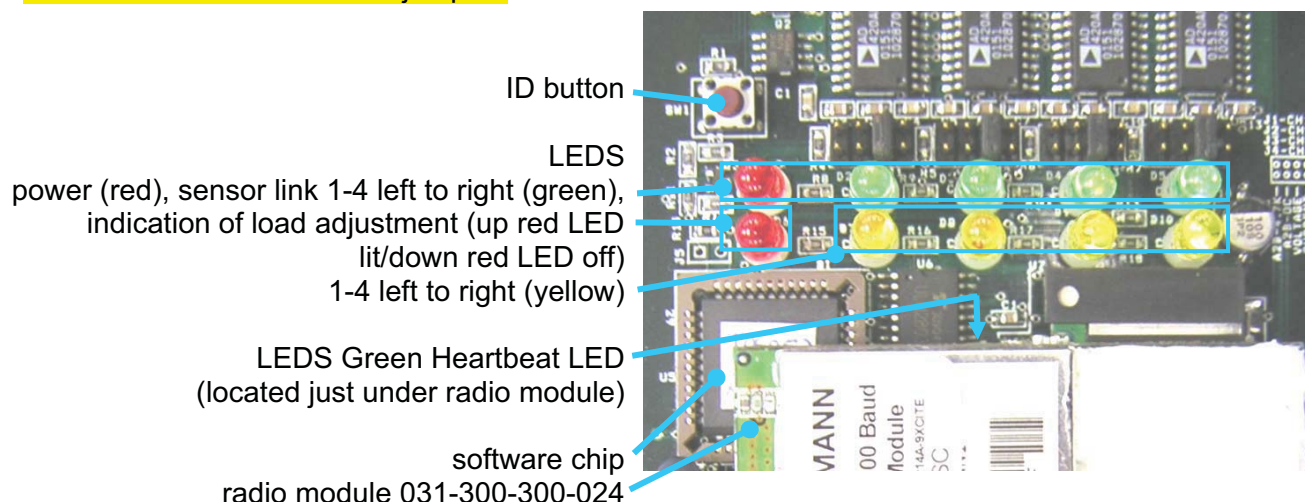
### 6.3 TRS 05 SETUP OVERVIEW

This section is a basic overview for the following Sections (TRS 05 [Sensor Output Setup](#) and [Load Sensor Calibration](#)). Press and hold ID button, release the button at the desired indication (or the number seconds) defined in the following table. The following table can be use as a quick reference guide when setting up the sensors on the TRS 05 and calibrating the load cell.

NOTE: If an incorrect menu is activated or the button is released accidentally, simply cycle the power and start over.

Menu Selection Release ID Button	Indication	Indication Starts (Sec)	Indication Ends (Sec)
Install/setup sensor on channel 1	blinking green LED 1	3	6
Install/setup sensor on channel 2	blinking green LED 2	6	9
Install/setup sensor on channel 3	blinking green LED 3	9	12
Install/setup sensor on channel 4	blinking green LED 4	12	15
Uninstall a sensor on channel 1	solid LED 1	16	19
Uninstall a sensor on channel 2	solid LED 2	19	22
Uninstall a sensor on channel 3	solid LED 3	22	25
Uninstall a sensor on channel 4	solid LED 4	25	28
Set all the analog outputs for voltage 0-5V	All 4 green LEDs blinking	29	32
Set all the analog outputs for 4..20ma	All 4 green LEDs solid	33	36
Set all the analog outputs for voltage 1-9V	All 4 yellow LEDs blinking	37	40
Set all the analog outputs for voltage 0-9V	All 4 yellow LEDs solid	40	43
Calibrate load/angle sensor on channel 1	blinking yellow & green LEDs 1	43	46
Calibrate load/angle sensor on channel 2	blinking yellow & green LEDs 2	46	49
Calibrate load/angle sensor on channel 3	blinking yellow & green LEDs 3	50	53
Calibrate load/angle sensor on channel 4	blinking yellow & green LEDs 4	53	56
Remove all sensors and calibrations	blinking yellow LED 1	56	59
No action performed	blinking yellow LED 2	59	63
No action performed	blinking yellow LED 3	63	66
No action performed	blinking yellow LED 4	67	70
Exit/No action	LEDs off no	71	

**NOTE: Remember to set the jumpers**



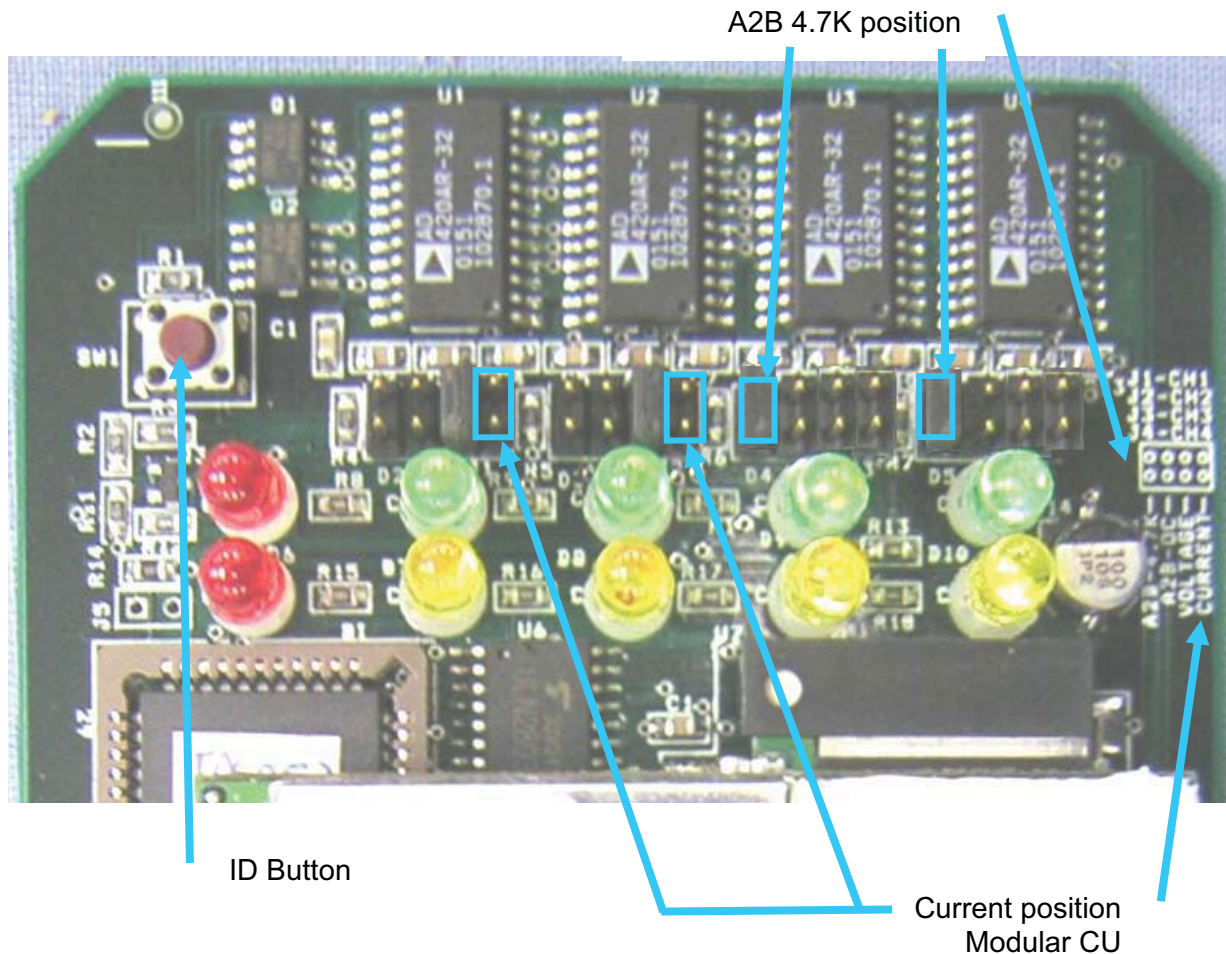


## 6.4 SENSOR OUTPUT SETUP

The sensor output is setup for the hardware (bridge place on jumpers 1 & 2, as shown below) for the load cells and software (use the ID button software output). If the hardware and software do not match an error will occur.

### 6.4.1 Hardware

Install the bridge in the in the correct position; modular system – current or standard system – voltage on jumpers 1 and 2, as show above. If a sensor is not installed, the bridges and jumpers will not effect the operation of the unit.



### 6.4.2 Software

Setup the software for the output of the TRS 05:

**NOTE:** Remember to set the jumpers

**Modular System – current:** Hold the ID button for about 33 36 seconds until all 4 green LEDs are solid and released ID button to set all the analog outputs for 4...20mA current.

## 6.5 CENTRAL UNIT INSTALLATION

The power supply will be from 10- 30 volt DC. The signal output of the TRS 05 is dependent on the placement of red bridges installed on the channel jumpers: 1 (for signal #1), 2 (signal #2), 3(signal #3), and 4(signal #4). Each jumper has 4 bridge positions as follows:

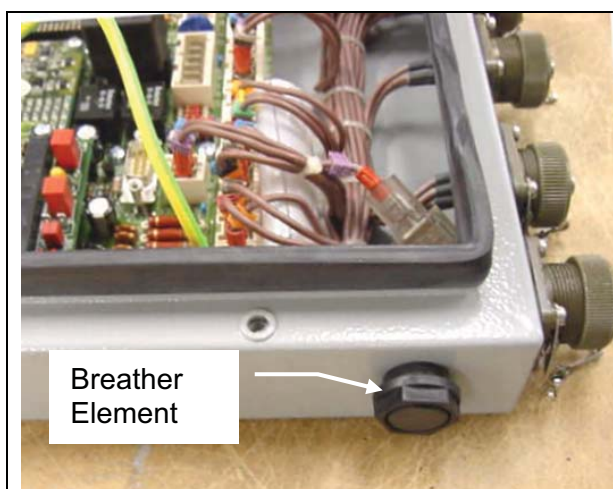
1-2 voltage output 0..5V (required for the standard DS350 system)

3-4 amperage output 4..20mA (required for the modular DS350 system)

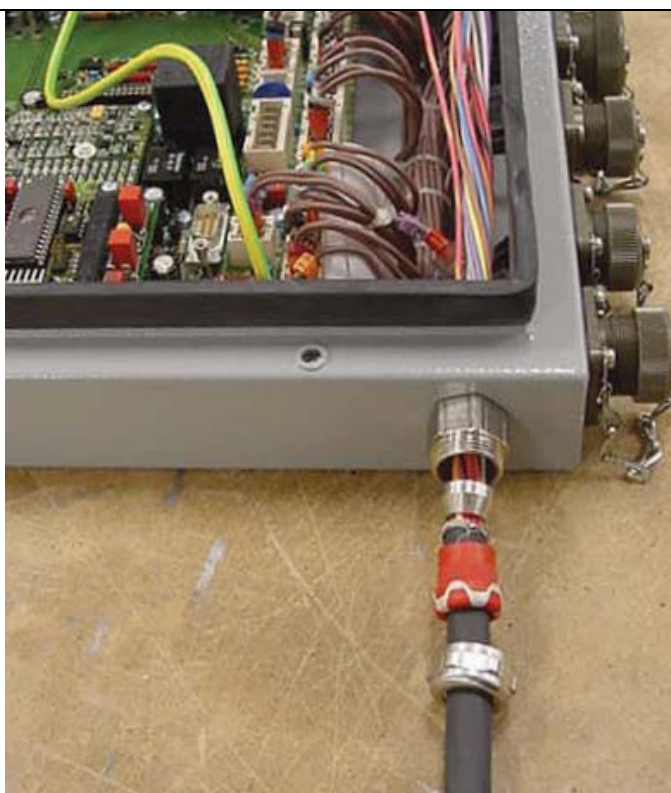
5-6 digital output

7-8 A2B switch output

### 6.5.1 TRS 05 Installation on the DS350 modular system central unit.



1. Remove breather element, use a M21 wrench to hold the PG11 nut inside the central unit.
2. Insert PG11 strain relief and tighten nut.
3. Insert cable as shown, so the shield will ground on the strain relief cone. There should be about 12 inches of cable inside the central unit to make the proper connections.
4. Connect to the central unit as shown below. Refer to system wiring below





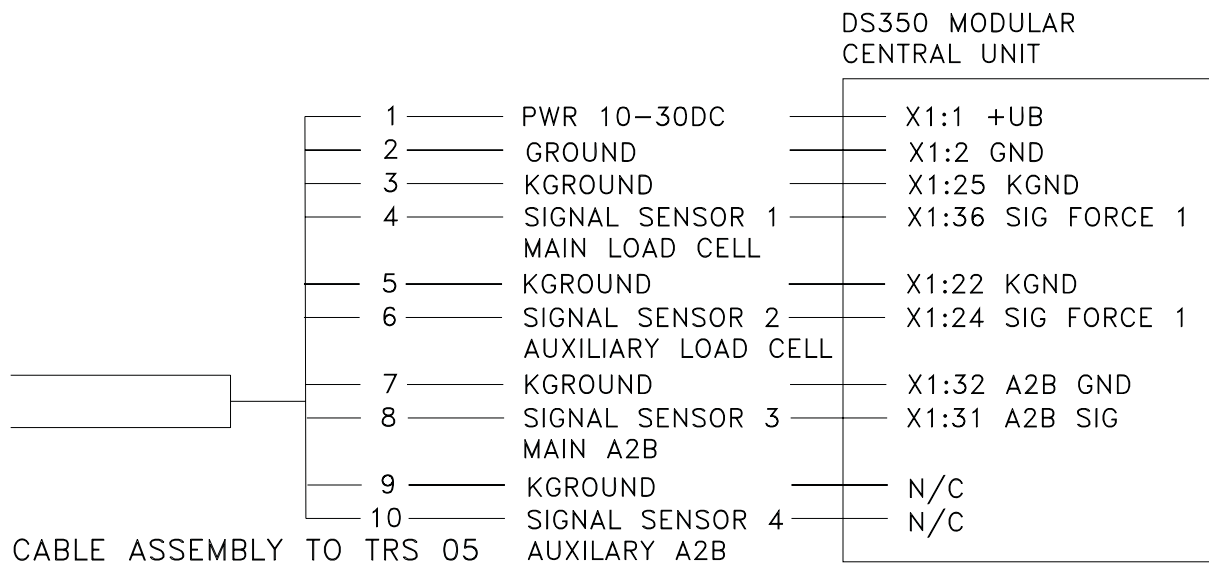
**Wiring information:**

**Power:** the TRS 05 wires on X1:1 and X1:2 will need to be added to the existing wiring. Do not remove the existing wire on these terminals.

**Radio Load Cell wires on signal sensor 1 and 2:** Remove the existing wires from terminal X1:25, X1:36, X1:22, and X1:24 and add the TRS 05 wire as shown.

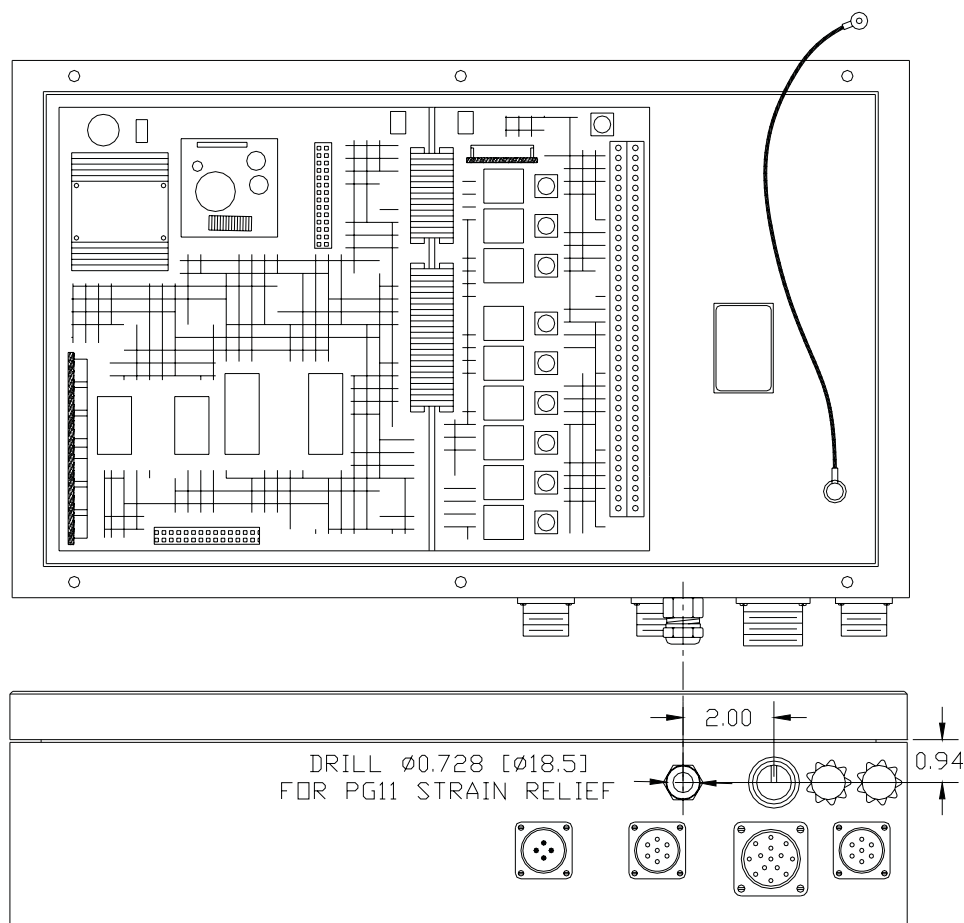
**Hardwired Anti Two-Block Switch:** If the hardwired A2B switch is being used; do NOT remove the existing wires from X1:31 and X1:32. Do NOT wire # 7 and 8 from the TRS 05.

**Radio Anti Two-Block Switch:** If one or two radio A2B switch(es) are being used; remove the existing wires from X1:31 and X1:32 and add the TRS 05 wire as shown. The second switch on signal sensor 4 does not need to be wired. The TRS 05 software recognizes an A2B switch is connected to signal sensor channel 3 and 4; therefore, if either switch is opened the signal is sent to the central unit.



### 6.5.2 TRS 05 Installation on the DS350 standard system central unit.

Metal shaving inside the central unit could cause a short or damage electrical components inside the central unit. Use some type of protective plastic cover to shield the board from metal shavings, drill a 23/32" (0.718") hole in the central unit housing in the location shown. Clean all metal shavings from the central unit. Insert PG11 strain relief and tighten nut. Insert cable in the strain relief as shown, leaving about 12" of wire in the central unit. The shield will ground on the strain relief cone and strain relief will be tightened around the red/white insert.



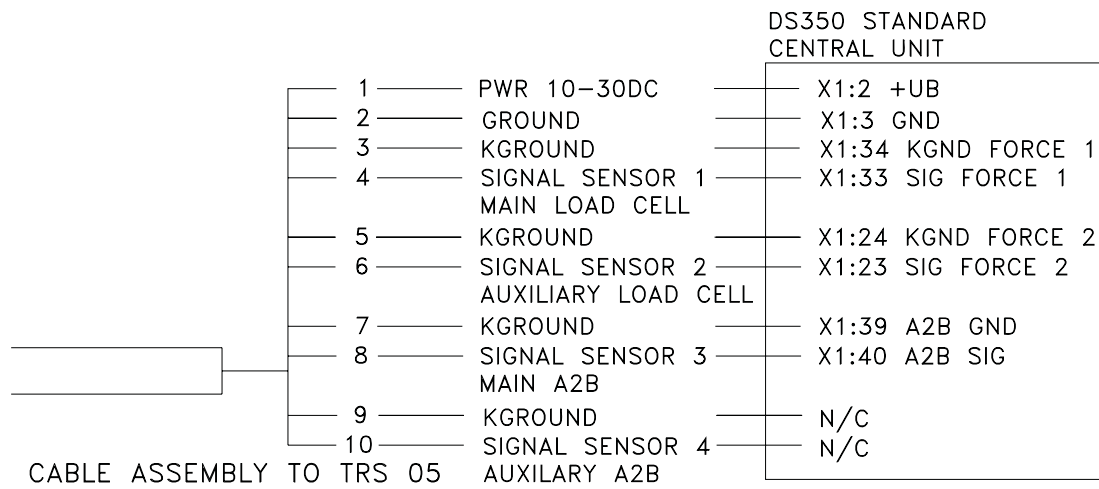
**Wiring information:**

**Power:** the TRS 05 wires on X1:2 and X1:3 will need to be added to the existing wiring. Do not remove the existing wire on these terminals.

**Radio Load Cell wires on signal sensor 1 and 2:** Remove the existing wires from terminal X1:34, X1:33, X1:24, and X1:23 and add the TRS 05 wire as shown.

**Hardwired Anti Two-Block Switch:** If the hardwired A2B switch is being used; do NOT remove the existing wires from X1:39 and X1:40. Do NOT wire # 7 and 8 from the TRS 05.

**Radio Anti Two-Block Switch:** If one or two radio A2B switch(es) are being used; remove the existing wires from X1:39 and X1:40 and add the TRS 05 wire as shown. The second switch on signal sensor 4 does not need to be wired. The TRS 05 software recognizes an A2B switch is connected to signal sensor channel 3 and 4; therefore, if either switch is opened the signal is sent to the central unit.

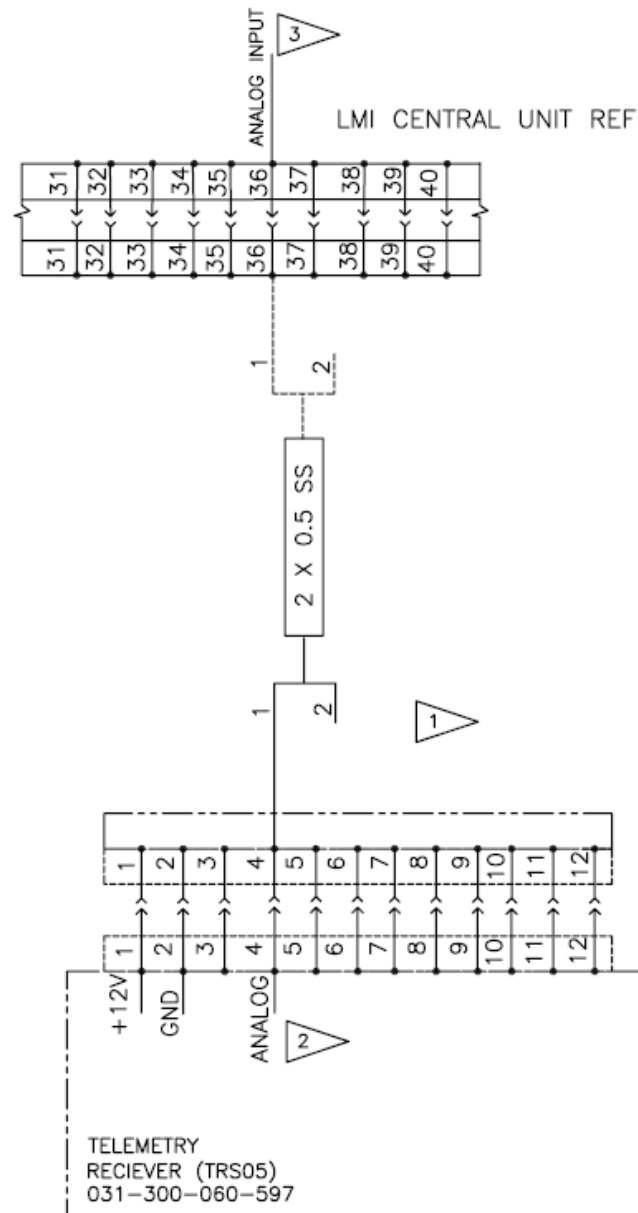


## 6.6 IFLEX INSTALLATION

### 6.6.1 Wiring Diagrams

#### NOTES:

- 1 CUT, TAPE AND STOW WIRE.
- 2 WIND FORCE SIGNAL
- 3 ANALOG INPUT 3 IF iFLEX5.  
ANALOG INPUT 2 IF iFLEX2.



## 7 TRS 05 SENSOR INSTALLATION

### 7.1 INSTALL SENSOR / TRANSMITTER

Setup the sensors on the 4 channels with the sensor as described below and mark the sensors, i.e. CH1, MAIN, or LOAD 1. Note: The following list corresponds with the installation wiring in this manual. Tip: bring the sensor close to the TRS 05 receiver/cab, not necessary but will simplify the procedure. Remove the battery covers from the sensors to be installed.

**Main load cell - channel 1;** Press and hold the ID button for 3-6 seconds until the 1<sup>st</sup> green LED's will begin blinking and release the ID button. The receiver begins to search for a transmitter ID code. On the load sensor/transmitter, remove the card from the batteries or remove two batteries for 10 seconds and replace them. In less than 10 seconds, the 1<sup>st</sup> green LED will become solid when the transmitter is linked.

**Auxiliary load cell - channel 2;** Press and hold the ID button for 6-9 seconds until the 2<sup>nd</sup> green LED's will begin blinking and release the ID button. The receiver begins to search for a transmitter ID code. On the load sensor/transmitter, remove the card from the batteries or remove two batteries for 10 seconds and replace them. In less than 10 seconds, the 2<sup>nd</sup> green LED will become solid when the transmitter is linked.

**NOTE: A new sensor or transmitter maybe install over an existing sensor on a channel, when this occurs the previous link/ID code are removed from memory and the new one stored.**

### 7.2 UNINSTALL SENSOR / TRANSMITTER

If a sensor is setup on the channel the LED will be ON, press and hold the ID button (16-28 seconds) through the Install Sensor mode (blinking LEDs1-4) until the correct 1-4 LED is solid. When the correct LED is solid, channel to be uninstalled, release the ID button. The sensor for the selected channel/LED 1-4 will be uninstalled and the system will be in normal operating mode.

As the ID button is held (16-28 seconds) through the Install Sensor mode (blinking LEDs1-4) and released at the solid LED, the following actions will occur:

- Green LED 1 solid: Uninstall sensor 1.
- Green LED 2 solid: Uninstall sensor 2.
- Green LED 3 solid: Uninstall sensor 3.
- Green LED 4 solid: Uninstall sensor 4.

## 8 LOAD CELL INSTALLATION

**NOTE: After installation the load cell will need to be zeroed with no force applied and adjusted to a permissible heavy load.**

The load cell and plates are installed at the dead end of the wire rope that is being used to lift the load. The appropriate pins (length and diameter) for the type and size of socket, block, or ball must be used. Ensure that the correct pin used is rated for the maximum line pull capacity and the side load plates will be straight when attaching the dead end lug and the load cell. Install the side plates using the 2-1/4" pin so the pin head is on the antenna side. Ensure all safety pins are installed properly with washers and bushing to fit the hole diameter and pin length.

## 9 SENSOR CALIBRATION

The calibration process should only be preformed when necessary.



While the ID button is held or in the calibration process, the sensor outputs will not correctly indicate the status of other installed sensors. Correct operation will return when the menu is exited or calibration process is complete or system is powered off/on.

The load cell must be calibrated to ensure accuracy. The load sensor calibration is completed complete the following steps:

1. Installing the load cell sensor (refer to 7.1 Install Sensor, if not complete)
2. Zero the load cell. The zero point adjustment will have an even affect across the entire range (for example, 200 lb at both low and high loads).
3. Adjust the gain to a 70% permissible load. The gain adjustment will have only a small effect on light loads, but a large effect on heavy loads.

Note: If an incorrect menu is activated or the button is released accidentally, simply cycle the power and start over.

Note: When the system is in calibration mode, the RCL system NOT in operation; therefore, crane operating guide line and load charts must be followed during calibration mode or other crane operations.

NOTE: The unit will remain in main or auxiliary calibration mode until power is cycled off/on. After completing the main load cell calibration, cycle power off/on and complete the auxiliary load calibration.

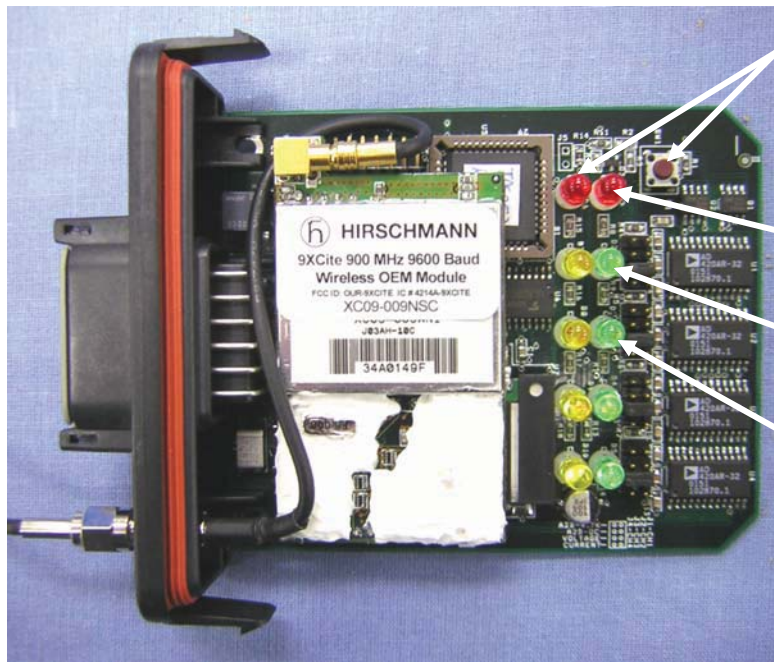
**Main load cell calibration:** Press and hold the ID button for 43-46 seconds until the 1<sup>st</sup> yellow and green LED's will begin blinking and release the ID button. The 1<sup>st</sup> yellow and green LED will become solid, showing the receiver is now in calibration mode for the main load cell on channel 1. Complete sensor zero and gain adjustments in this section.

**Auxiliary load cell calibration:** Press and hold the ID button for 46-49 seconds until the 2<sup>nd</sup> yellow and green LED's will begin blinking and release the ID button. The 2<sup>nd</sup> yellow and green LED will become solid, showing the receiver is now in calibration mode for the auxiliary load cell on channel 1. Complete sensor zero and gain adjustments in this section.

**A2B calibration:** No calibration necessary for A2B.

**Wind speed sensor calibration:** No calibration necessary for wind speed sensor.

**Angle sensor calibration:** The angle zero point may be adjusted in the same manner as the load cell zero point is adjusted. There is no gain adjustment for the angle sensor.



LED on increase load  
LED off decrease load

Power on

Blinking yellow and green LED  
calibrate channel/sensor #1

Blinking yellow and green LED  
calibrate channel/sensor #2

Calibration mode is when the ID button is used to increase or decrease the displayed load to match the actual load. If the alarm LED is on, when the ID button is pressed the displayed load will increase until the button is released and the LED will go off. If the alarm LED is off, when the ID button is pressed the displayed load will decrease until the button is released and the LED will come on.

Next the zero point and gain adjustments must be setup. The zero point must be a no load adjustment and the gain adjustment is at least a 70% permissible load adjustment.

## 9.1 LOAD SENSOR ZERO POINT

To set the zero point of the load cell, place the load cell on the ground and ensure that no load is on the load cell, including any hook block, lengths of cable, etc. The software will only allow the load cell to be zeroed when there is no load on the load cell. If there is a load on the load cell, the software will define this as a gain adjustment.

What is the load displayed on the console? Does the load need to be increased or decreased? The red LED next to the yellow LED defines if the load will increase (RED LED "ON") or decrease (RED LED "OFF"). If the RED LED "ON", pressing the ID will increase the load. When the ID button is released, the RED LED goes "OFF". Pressing the ID button will now decrease the load. When the ID button is released, the RED LED goes "ON". Press the ID button until the displayed load is zero. For the DS350G standard system, if the load can NOT be zeroed, the Additional Zero Point Adjustment for the DS350G standard system must be complete.

The LEDs will not change after zero point has been set.

## 9.2 LOAD SENSOR GAIN ADJUSTMENT TO A 25% PERMISSIBLE LOAD

To calibrate the gain of the load cell, a known load must be lifted. Check the load display by lifting a load of known weight. The accuracy of the load indication shall be within the tolerance of SAE J376, refer to complete SAE standard before testing. Refer to [Accuracy and Test Requirements](#) below before completing the calibration.

Ideally, the load should be as heavy as permissible given the load cell and crane configuration chosen. When calculating the load on the load cell, it must be remembered to add the weight of any headache ball, hook block, and rope used (depending on load cell location).

The software automatically switches from zero point to the gain adjustment when a load greater than 25% of the maximum load cell value is applied to the load cell.

View the load reading on the display, and use the ID button to increase or decrease the reading as necessary, in the same manner as was used to adjust the zero point.

When calibration is completed, re-check the zero point, a light load (hook block and rigging, a medium load, and the load used for the gain adjustment).

If a new load cell is installed, or the load cell is uninstalled and re-installed, the calibrations must be repeated. Installing a load cell causes the calibrations to revert to their default settings.

Exit the calibration mode by turning off the power supply to the TRS 05. Calibration settings are saved to long term storage when the power turns on.

### 9.2.1 Accuracy and Test Requirements

#### Accuracy

The accuracy of the load indicating system is to be such that the indicated load is not less than 100% of the actual load, nor more than 110% of the actual load. Where the system cannot meet the accuracy criteria at the lower load range, conspicuous labeling or signaling is to be provided indicating that these accuracy criteria cannot be met.

The weight of the load being lifted and all additional equipment such as blocks, slings, sensors, etc.; also referred to as working load.

#### Test Requirements

System tests are to be conducted using an appropriate configured crane and specified load rating chart.

For system calibration, three or more test radii or boom angle are to be employed to establish compliance with the accuracy section above. Test loads shall be as near as is practical to minimum, mean, and maximum values within the operating limits.

One of the following test methods or equivalent is to be used:

#### Known Weight

Test load to be applied by suspending known weights accurate to  $\pm 1\%$ . If the weights of all additional equipment such as blocks, slings, sensors, etc., are included in the test load, the total load is to be known to an accuracy of  $\pm 1\%$ .



### Fixed Anchor (Deadman)

Test load to be applied by hoisting against a fixed anchor or deadman equipped with a means for measuring loads accurate to  $\pm 1\%$ . If the weights of all additional equipment such as blocks, slings, sensors, etc., are included in the test load, the total load is to be known to an accuracy of  $\pm 1\%$ .

The system accuracy is to be determined from the following formula:

$$\frac{\text{Indicated Load}}{\text{Actual Load}} \times 100 = \% \text{ of Load}$$

## 9.3 SENSOR OUTPUT RANGES

### 9.3.1 Wind Speed Output

	Output	Speed(mph)
Voltage	0V	0 mph
	5V	50 mph
Current	4mA	0 mph
	20mA	50 mph
1-9V	1.8V	0 mph
	9.0V	50 mph

### 9.3.2 Load Cell Output

Load Cell default range, adjustable via calibration

	Output	Load (%)
Voltage	0V	0%
	2.5V	100%
Current	4mA	0%
	20mA	100%
1-9V	1.8V	0%
	9.0V	100%

Note: Pending load cell type

2.5V = 100% of load cell range, 7.5T or 22.5T

20ma = 100% of load cell range, 7.5T or 22.5T

9.0V = 100% of load cell range, 7.5T or 22.5T

### 9.3.3 Angle Output

	Output	Degrees
Voltage	-3.125V	0
	-1.875V	90
Current	20mA	0
	4mA	90
1-9V	1.8V	0
	9.0V	90

## 10 SERVICE AND TROUBLESHOOTING

### 10.1 SERVICE

Daily maintenance of the system consists of inspecting:

1. The electrical wiring connecting the various parts of the system.
2. If electrical wiring is damaged, it shall be replaced immediately.
3. If the insulation is worn on the electrical wiring or antennas are damaged, these parts shall be replaced.
4. A damaged or punctured housing or cover must be replaced immediately to prevent ingress of water and damage to the internal circuitry.

Other than correcting the problems identified in the Malfunctions Table and replacing faulty mechanical parts and cables, no other repairs shall be made.

### 10.2 TROUBLESHOOTING

#### 10.2.1 Receiver

After the onboard diagnostics have been performed, follow these guidelines

Problem	Cause	Solution
Power LED does not light	No power to receiver	Make sure the receiver is getting power from the crane. Check wiring. Ensure correct polarity of the power. Open receiver and check green blinking status of LED.
Communication error	Low battery	Verify which sensor is causing the error by looking at the communication error screen. Replace batteries.
Communication error	Faulty sensor	Verify which sensor is causing the error by looking at the communication error screen. Verify that the LED on the sensor is blinking.
Communication error	Poor reception	Verify which sensor is causing the error by looking at the communication error screen. Verify that the LED on the sensor is blinking. Verify that the sensor is line of sight to the receiver.
Communication error	Sensor not installed.	Install the sensor on the receiver. See adding sensors
Communication error	Poor communication caused by interference.	Remove potential interference sources from the area. Mount the receiver in a different location.
Transmitter LED does not flash	Sensor is asleep.	Change the status of the sensor.
Transmitter LED does not flash	Batteries dead.	Replace the batteries.

Receiver LED	Definition
LED Sensor On Line 1 through 4 (Green)	Indicates the status of the communication link between sensor 1-4 transmitter and the receiver. Failure of the communication link will cause the Green LED to flash and the signal output will change to the following condition: <ul style="list-style-type: none"> <li>4..20mA output will be 0mA</li> </ul>
Alarm LED (Red)	Indicates a lock out condition. This LED will light simultaneously with the engaging of the lock-out solenoids (if installed).
LED Sensor Low Battery 1 through 4 (yellow)	When the light goes off, it indicates that the battery of the sensor 1-4 transmitter needs to be replaced.

### 10.2.2 Repeater

The red power LED should be on after switching on the repeater from the crane ignition switch, the system starts with an automatic test of the repeater board, LEDs, and electronic components. The other red LED blinks when the repeater is transmitting a signal. This can be compare to the load cell transmitter when sitting side by side; the repeater module should transmit immediately after the load cell.

## 10.3 TROUBLESHOOTING MOISTURE

The receiver and repeater contain electronic components and have an IP65 protection rating. These electronic components cannot be designed to withstand exposure to moisture over a longer period of time. If you find water or moisture inside any of the housings, the source for the water ingress has to be detected and corrected to ensure proper operation.

There are two major possibilities for the occurrence of excessive moisture inside an enclosure:

- 1) Water ingress; caused by a cracked or broken housing or lid, or a defective gasket.
- 2) Condensation

This outline gives instructions for detecting the cause for excessive moisture by using simple troubleshooting methods and how to prevent the moisture ingress from happening again.

## 11 MAINTENANCE

The only maintenance required is to change the batteries when required. Also, check the mounting hardware daily to ensure that there is no damage. Replace any damaged parts before operating the crane.

**Recommendation:** We recommend lithium batteries for cold temperatures (below -20C). Alkaline batteries are rated from -20C to 54C (-4F to 130F). Lithium batteries are usually rated from -55C to +85C (-67F to 185F). We recommend the TL-2200/S available from Newark.com.

### 11.1 BATTERY REPLACEMENT

To replace the batteries, remove the 4 screws from the transmitter housing. During battery replacement, use caution when opening the battery cover and transmitter to avoid damage to the gasket causing moisture ingress which could corrode the batteries and terminals. Inspect the gasket surface on the transmitter for nicks or other damages that may prevent the gasket from sealing. If it appears to be damaged, a replacement gasket should be installed.

Install 4 fresh batteries into the proper location and direction as indicated on the battery holder.

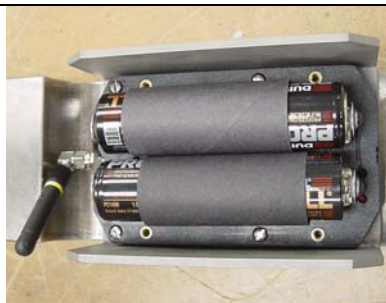
Make sure that the cardboard tube is installed as shown.



Loosen 4 Screws



Battery Direction Label



INSTALLED BATTERIES

Insert the batteries and cardboard sleeves. Ensure the LED starts to flashing, when the batteries are first install in a force transducer transmitter. LED comes on for 1 second, off 1 sec and back on for 1 sec, then begins to flash.



Visually inspect the gasket and tighten the battery cover in place with the 4 cover screws.

## 12 SPARE PART NUMBERS

### 12.1 Receiver



031-300-050-671  
ANTENNA, 918 MHz FOR  
TRS05ASSEMBLY 060-576  
WHIP ELEMENT

031-300-050-672  
ANTENNA, 918 MHz  
MAGNETICBASE 13' long  
wire

031-300-060-597 RADIO, RECEIVER, TRS05-2SPREAD  
SPECTRUM W/NEG VOLT OUT





031-300-060-577 Cable Assembly 15'



031-300-060-596 TRS 05 REPEATER  
031-300-050-688 ANTENNA, 918 MHz RCL 90°



031-300-060-601 CABLE ASSY, 15' 2 COND SS  
20AWG W/12 SKT DEUTSCH



031-300-060-609 SENSOR ASSY,  
FORCE TRANS. 45KRADIO SPREAD  
SPECTRUM REV.-

031-300-050-535 CONNECTOR, SMA RIGHT  
ANGLE M/FREVERSE POLARITY

031-300-060-559 ANTENNA ASSY, 918  
MHz WHIP FORLOAD CELL

## 12.2 A2B



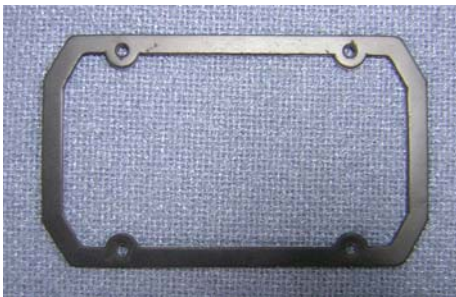
**031-300-060-593**  
**Radio A2B transmitter assembly**



**031-300-060-586**  
**Radio A2B transmitter**



**Antenna only**  
**031-300-050-688**



**031-300-050-763**  
**Neoprene rubber gasket**



**031-002-060-022**  
**Radio A2B switch**





**031-300-050-295**  
**A2B Mounting standoff**



**031-300-050-264**  
**A2B mounting plate**



**031-300-050-272**  
**Lynch pin**

## 12.3 Wind



**031-300-050-321**  
**Mounting pole**



**031-300-050-480**  
**Anemometer mounting plate**



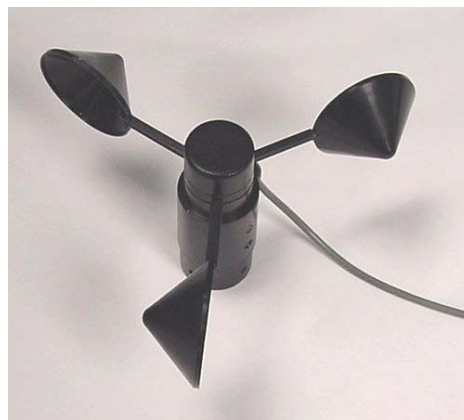
**031-300-050-322**  
**Pin**



**031-300-060-586**  
**Transmitter**



**031-300-050-323**  
**Retaining pin**



**031-300-050-507**  
**Sensor**



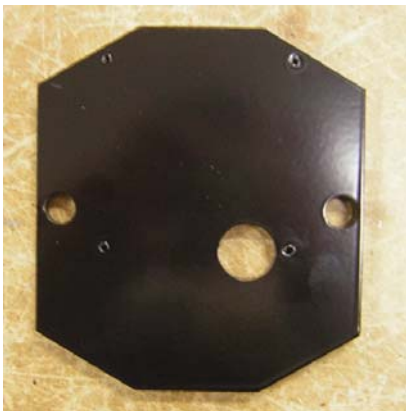
031-300-060-607 SENSOR ASSY,  
WINDSPEED RADIO MTG PLATE SPREAD  
SPECTRUM

031-300-050-688 ANTENNA,  
918 MHz RCL 90°

## 12.4 Angle



**031-300-060-592**  
**Sensor, Angle w/ Transmitter**



**031-300-050-577**  
**Plate, Radio Angle Mounting**

## 12.5 Antenna options

Mount antennas in identical positions and in a direct line between transmitter and receiver, ensuring that no obstructions will interfere with the transmission of the radio signal.









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